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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/077,854	02/20/2002	Hiroyuki Hoshiya	520.41222X00	3183

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ANTONELLI, TERRY, STOUT & KRAUS, LLP
 1300 NORTH SEVENTEENTH STREET
 SUITE 1800
 ARLINGTON, VA 22209-9889

EXAMINER

MAGEE, CHRISTOPHER R

ART UNIT PAPER NUMBER

2653

DATE MAILED: 10/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/077,854

Applicant(s)

HOSHIYA ET AL.

Examiner

Christopher R. Magee

Art Unit

2653

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5,9-12,16-22 and 26-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-5,9-12,16-22,26 and 27 is/are allowed.
- 6) ☒ Claim(s) 28-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/29/2004 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

- Claims 28-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dill et al. (hereinafter Dill) (US 6,023,395) in view of Sakaguci et al. (hereinafter Sakaguci) (US 6,633,466 B1).

- Regarding claims 28, 31, 34 and 37-41, Dill discloses a magnetic head provided with a spin valve type magnetoresistive element in which a ferromagnetic layer [118], which a direction of the magnetization is substantially pinned for an external magnetic field and a soft magnetic free layer [132], the magnetization of which can be turned according to an external magnetic field are laminated via a non-magnetic intermediate layer [120] and characterized in that the magnetization of the soft magnetic free layer [132] is rotated according to the external magnetic

Art Unit: 2653

field when induced, a relative angle between a direction of the magnetization of the soft magnetic free layer [132] and a direction of the magnetization of the ferromagnetic layer [118] varies and magnetoresistance is produced [Fig. 4A] wherein:

a single magnetic domain turning ferromagnetic layer [150] is formed on the soft magnetic free layer [132] via a non-magnetic separating layer [152] [Fig. 4A];

the single magnetic domain turning ferromagnetic layer [150] turns the soft magnetic free layer [132] a single magnetic domain so that soft magnetic free layer [132] has magnetization substantially induced in direction substantially perpendicular to an external magnetic field [Fig. 4A].

the soft magnetic free layer [132] and the single magnetic domain turning ferromagnetic layer [150] are magnetostatically coupled via the non-magnetic separating layer [152] at the end of the track width and a closed magnetic circuit is formed, where no ferromagnetic or antiferromagnetic coupling is produced; and

the single magnetic domain turning ferromagnetic layer [150] has effectively fixed magnetization in the direction of substantially perpendicular to an external magnetic field from a magnetic medium [col. 6, lines 25-29].

Dill does not disclose a single magnetic domain turning ferromagnetic layer formed by a layered film having ferromagnetic or antiferromagnetic coupling between a hard magnetic film and a soft magnetic buffer layer via a coupling film and the magnetization of the hard magnetic film and the magnetization of the soft magnetic buffer layer are polarized in a direction substantially perpendicular to an external magnetic field.

Sakaguci teaches a single magnetic domain turning ferromagnetic layer (i.e., laminated longitudinal biasing layer [9]) formed by a layered film having ferromagnetic or antiferromagnetic coupling between a hard magnetic film [6] and a soft magnetic buffer layer [8] via a coupling film [7; col. 6, lines 10-32] and the magnetization of the hard magnetic film and the magnetization of the soft magnetic buffer layer are polarized in a direction substantially perpendicular to an external magnetic field [col. 4, line 66 to col. 5, line 17].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the single magnetic domain turning ferromagnetic layer of Dill with a laminated structure formed by a layered film having ferromagnetic or antiferromagnetic coupling between a hard magnetic film and a soft magnetic buffer layer via a coupling film; and the magnetization of the hard magnetic film and the magnetization of the soft magnetic buffer layer are polarized in a direction substantially perpendicular to an external magnetic field as taught by Sakaguci.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to provide the single magnetic domain turning ferromagnetic layer of Dill with a laminated structure formed by a layered film having ferromagnetic or antiferromagnetic coupling between a hard magnetic film and a soft magnetic buffer layer via a coupling film; and the magnetization of the hard magnetic film and the magnetization of the soft magnetic buffer layer are polarized in a direction substantially perpendicular to an external magnetic field as taught by Sakaguci in order stabilize the magnetization direction of the free layer [Sakaguci; col. 3, lines 25-27].

Art Unit: 2653

➤ Regarding claims 29, 30, 33, 35 and 36, Dill teaches that the non-magnetic layer [152] being formed by a deposition of a layer including at least one of Cu, Au, Ag, Pt, Re, Ru, Ir, Os, Ta, Hf, Nb, Ti and W or a layer including these and a layer made of oxide or a mixture of least one of Cu, Au, Ag, Pt, Re, Ru, Ir, Os, Ta, Hf, Nb, Ti and W and oxide [col. 6, lines 19-24].

Allowable Subject Matter

3. Claims 1-5, 9-12, 16-22, 26 and 27 are allowed. The following is a statement of reasons for the indication of allowable subject matter:

- Claims 1, 2 and 16 specify a magnetic head, which requires:

“the single magnetic domain turning ferromagnetic layer is provided with a hard magnetic film made of a mixture of a semiconductor and ferromagnetic material.”

Dill et al. (US 6,023,395) and/or Sakaguci et al. (US 6,633,466 B1) do not teach or suggest as claimed in the present invention.

Dill '395 discloses the single magnetic domain turning ferromagnetic layer [150] may be formed from a single layer of a high coercivity material such as an alloy of Co and one or more other elements, such as Co-Pt binary alloy, or a Co-Pt-Cr ternary alloy (e.g., Co₇₅Pt₁₂Cr₁₃) or a Co-Pt-Ni ternary alloy or a Co-Cr-Ta ternary alloy. In addition to using a single layer of high coercivity material, such as CoPtCr, as the biasing ferromagnetic layer, there are two other structures that will serve as the biasing ferromagnetic layer. First, the biasing ferromagnetic layer may be a bilayer formed from a first ferromagnetic film of a lower coercivity material, such as 5 nm of Ni-Fe, and a second ferromagnetic film of a higher coercivity material, such as 10 nm of CoPtCr [col. 12, lines 40-52].

Sakaguci '466 teaches a single magnetic domain turning ferromagnetic layer [9] may formed from a by a layered film having ferromagnetic or antiferromagnetic coupling between a hard magnetic film [6] and a soft magnetic buffer layer [8] via a coupling film [7; col. 6, lines 10-32]. The hard magnetic film [6] being formed of a CoPt alloy or other magnetic material.

Therefore, these features, in combination with other features of claims 1, 2 and 16, are not anticipated by, nor made obvious over, the prior art of record of Dill '395 and/or Sakaguci '466.

Response to Arguments

4. Applicant's arguments with respect to claims 28-41 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher R. Magee whose telephone number is (703) 605-4256. The examiner can normally be reached on M-F, 8: 00 am-5: 30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Korzuch can be reached on (703) 305-6137. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2653

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

October 18, 2004



Christopher R. Magee
Patent Examiner
Art Unit 2653

A. J. HEINZ
PRIMARY EXAMINER
GROUP ~~2600~~ A.U. 2653

